



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

PL

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/098,571	03/18/2002	Tadashi Sakai	220662US2TTCRD	3208

22850 7590 08/25/2003

OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.  
1940 DUKE STREET  
ALEXANDRIA, VA 22314

EXAMINER

COLON, GERMAN

ART UNIT PAPER NUMBER

2879

DATE MAILED: 08/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/098,571	SAKAI ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	German Colón	2879	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                  | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). ____.  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>4</u> . | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Drawings***

1. The drawings are objected to because:

On Page 6, line 24, reference numbers 17 and 18 are related to electron emitters which coat the cathode-supporting members. However, in Fig. 1, left side, reference number 16 is the electron emitter coating the cathode-supporting member.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1, 3 and 4 are rejected under 35 U.S.C. 102(b) as being anticipated by Kumar (US 5,861,707).

Regarding claim 1, Kumar discloses a cold cathode comprising:

a supporting member 12; and an electron emitter supported by the supporting member (see Figs. 3E and 5E) and having an electron-emitting surface to emit electrons, the electro-

Art Unit: 2879

emitting surface comprising a mixed phase of diamond phase **14** and conductive carbon phase **22** (see Col. 6, lines 1-4), and the conductive carbon phase extending in the form of a channel between the supporting member and the electron-emitting surface in the electron emitter.

Regarding claim 3, Kumar discloses the diamond phase comprising a granular body **14** and the carbon phase comprising a graphite (see Col. 6, lines 1-4), formed on a boundary surface of the granular body.

Regarding claim 4, Kumar discloses the electron-emitting surface being rough and the conductive carbon being exposed on the surface (see Figs. 3E and 5E).

4. Claims 1 and 2 are rejected under 35 U.S.C. 102(b) as being anticipated by Patterson et al. (US 6,441,550).

Referring to claim 1, Patterson discloses a cold cathode comprising:

a supporting member **303**; and an electron emitter supported by the supporting member (see Figs. 3A and 3B) and having an electron-emitting surface to emit electrons, the electron-emitting surface comprising a mixed phase of diamond phase **304** (see Col. 6, lines 10-12) and conductive carbon phase **305**, and the conductive carbon phase extending in the form of a channel between the supporting member and the electron-emitting surface in the electron emitter.

Referring to claim 2, Patterson discloses the diamond of the electron emitter including a donor impurity (see Col. 4, lines 27-31).

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 6, 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura et al. (US 6,281,626) in view of Kumar (US 5,861,707).

Regarding claim 6, Nakamura discloses a cold cathode discharge device comprising:

an envelope **23** filled with a discharge gas therein; and a cold cathode **11** positioned in the envelope (see Fig. 9), wherein the cold cathode comprises a supporting member and an electron emitter **13** with an electron-emitting surface to emit electrons supported by the supporting member; and the discharge gas including a rare gas and mercury (see Col. 10, line 49). Nakamura is silent regarding the electron emitter comprising a mixed phase of diamond phase and conductive carbon phase.

However, in the same field of endeavor, Kumar discloses a cold cathode comprising an electron emitter having a mixed phase of diamond phase and conductive carbon phase and teaches said electron emitter to provide a thermally stable emission area, a longer lifetime of the device in operation, and to require only a relatively small voltage for emission to occur (see Col. 3, lines 55-56, 62-63, and Col. 6, line 3). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the electron emitter disclosed by Kumar in the cold cathode discharge device of Nakamura, in order to provide a thermally stable

emission area, a longer lifetime of the device in operation, and to require only a relatively small voltage for emission to occur.

Regarding claim 9, Nakamura-Kumar discloses the diamond phase comprising a granular body and the carbon phase comprising a graphite (see Col. 6, lines 1-4 of '707), formed on a boundary surface of the granular body.

Regarding claim 10, Nakamura-Kumar discloses the electron-emitting surface being rough and the conductive carbon being exposed on the surface (see Figs. 3E and 5E of '707).

7. Claims 6-8, 11-13 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura et al. (US 6,281,626) in view of Patterson et al. (US 6,441,550).

Referring to claim 6, Nakamura discloses a cold cathode discharge device comprising:

an envelope 23 filled with a discharge gas therein; and a cold cathode 11 positioned in the envelope (see Fig. 9), wherein the cold cathode comprises a supporting member and an electron emitter 13 with an electron-emitting surface to emit electrons supported by the supporting member; and the discharge gas including a rare gas and mercury (see Col. 10, line 49). Nakamura is silent regarding the electron emitter comprising a mixed phase of diamond phase and conductive carbon phase.

However, in the same field of endeavor, Patterson discloses a cold cathode comprising an electron emitter having a mixed phase of diamond phase and conductive carbon phase, wherein the conductive carbon extends in the form of a channel, and teaches said electron emitter to provide a device having a longer lifetime and capable of operating at higher current densities and greater stability over longer time periods than emitter materials of the prior art (see Col. 6, lines

Art Unit: 2879

14-24). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the electron emitter disclosed by Patterson in the cold cathode discharge device of Nakamura, with the purpose of providing a device having a longer lifetime and capable of operating at higher current densities and greater stability over longer time periods than emitter materials of the prior art.

Referring to claim 7, Nakamura-Patterson discloses the discharge gas including xenon (see Col. 19, line 1 of '626).

Referring to claim 8, Nakamura-Patterson discloses the diamond of the electron emitter including a donor impurity (see Col. 4, lines 27-31 of '550).

Referring to claim 11, Nakamura-Patterson discloses the cold cathode discharge device being a discharge lamp (see Fig. 9 of '626).

Referring to claim 12, Nakamura-Patterson discloses the cold cathode discharge device being a PDP (see Fig. 28 of '626).

Regarding claim 13, claim 13 is rejected over the reasons stated in the rejection of claims 6 and 7.

Regarding claim 19, Nakamura-Patterson discloses the cold cathode discharge device being a discharge lamp (see Fig. 9 of '626).

8. Claims 13, 16, 17 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jin et al. (US 5,982,095) in view of Kumar (US 5,861,707).

Regarding claim 13, Jin discloses a cold cathode discharge device comprising an envelope (see Figs. 2, 6 and 7) filled with a discharge gas therein; and a cold cathode positioned

in the envelope, wherein the cold cathode comprises a supporting member **13** and an electron emitter **20** with an electron-emitting surface, and the discharge gas containing a gas including an element with a principal radiation peak of 200 nm or less in wavelength (see Col. 3, lines 33-34). Jin discloses the electron emitter comprising diamond, but is silent regarding the limitation of said emitter comprising a mixed phase of diamond phase and conductive carbon phase.

However, in the same field of endeavor, Kumar discloses a cold cathode comprising an electron emitter having a mixed phase of diamond phase and conductive carbon phase and teaches said electron emitter to provide a thermally stable emission area, a longer lifetime of the device in operation, and to require only a relatively small voltage for emission to occur (see Col. 3, lines 55-56, 62-63, and Col. 6, line 3). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the electron emitter disclosed by Kumar in the cold cathode discharge device of Jin, in order to provide a thermally stable emission area, a longer lifetime of the device in operation, and to require only a relatively small voltage for emission to occur.

Regarding claim 16, Jin-Kumar discloses the diamond phase comprising a granular body and the carbon phase comprising a graphite (see Col. 6, lines 1-4 of '707), formed on a boundary surface of the granular body.

Regarding claim 17, Jin-Kumar discloses the electron-emitting surface being rough and the conductive carbon being exposed on the surface (see Figs. 3E and 5E of '707).

Regarding claim 20, Jin-Kumar discloses the cold cathode discharge device being a PDP.



9. Claims 13-15, 18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jin et al. (US 5,982,095) in view of Patterson et al. (US 6,441,550).

Referring to claim 13, Jin discloses a cold cathode discharge device comprising an envelope (see Figs. 2, 6 and 7) filled with a discharge gas therein; and a cold cathode positioned in the envelope, wherein the cold cathode comprises a supporting member 13 and an electron emitter 20 with an electron-emitting surface, and the discharge gas containing a gas including an element with a principal radiation peak of 200 nm or less in wavelength (see Col. 3, lines 33-34). Jin discloses the electron emitter comprising diamond, but is silent regarding the limitation of said emitter comprising a mixed phase of diamond phase and conductive carbon phase.

However, in the same field of endeavor, Patterson discloses a cold cathode comprising an electron emitter having a mixed phase of diamond phase and conductive carbon phase, wherein the conductive carbon extends in the form of a channel, and teaches said electron emitter to provide a device having a longer lifetime and capable of operating at higher current densities and greater stability over longer time periods than emitter materials of the prior art (see Col. 6, lines 14-24). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the electron emitter disclosed by Patterson in the cold cathode discharge device of Jin, with the purpose of providing a device having a longer lifetime capable of operating at higher current densities and greater stability over longer time periods than emitter materials of the prior art.

Referring to claim 14, Jin-Patterson discloses the discharge gas being xenon (see Col. 3, lines 33-34 of '095).

Referring to claim 15, Jin-Patterson discloses the diamond of the electron emitter including a donor impurity (see Col. 4, lines 27-31 of '550).

Referring to claim 18, Jin-Patterson discloses the conductive carbon phase extending in the form of a channel between the supporting member and the electron-emitting surface in the electron emitter (see Figs. 3A and 3B of '550).

Referring to claim 20, Jin Patterson discloses the discharge device being a PDP.

### ***Prior Art of Record***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Yaniv et al., in US 6,181,056, discloses an emitter having a diamond phase and amorphous carbon or graphitic carbon.

Tuck et al., in US 6,097,139, discloses an emission layer comprising a graphitic inclusion in a thin film diamond layer.

Espinosa, in US 6,534,923, discloses an electron source having emitting films of nanocrystalline graphite and diamond.

### ***Contact Information***


Any inquiry concerning this communication or earlier communications from the examiner should be directed to German Colón whose telephone number is 703-305-5987. The examiner can normally be reached on Monday thru Friday, from 8:30 to 5:00.

Art Unit: 2879

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on 703-305-4794. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

  
gc

  
**ASHOK PATEL**  
**PRIMARY EXAMINER**